Curriculum Overview

Subject: Science

Ambition

By the end of year 11 a student of Science at Dixons Trinity will:

- Understand scientific principles that can be used to keep up with the ever changing world.

- Be equipped with the powerful knowledge needed to go on and implement change through the power of science.

- Translate practical skills from scientific experiments to skills that are needed in everyday life and possess the inquisitiveness to go and develop these skills in their careers.

Department Sentence

Ensured all students were equipped with the powerful scientific knowledge that will enable them to explain the world around them, to understand the scientific process and to develop an appreciation of the value of science in their everyday lives.

Principles

- **Intelligent sequencing of powerful knowledge**
    - Students at Dixons Trinity study biology, chemistry and physics every year to ensure that they are getting an equal and balanced exposure to all three separate sciences. We believe that our ambitious curriculum will prepare our students to be successful at university as they are gaining a wealth of knowledge and skills from each science facet.
    - We have a five year curriculum which embeds the key concepts from national curriculum and beyond. We teach a mixture of all three sciences and go beyond the national curriculum. It has been intelligently sequenced by first teaching science skills which is pivotal for all three sciences and is essential for students understanding how to use scientific equipment and how to conduct themselves accordingly in laboratory settings.
    - In biology we study human, animal and plant biology and their relationships with the environment. Throughout the 5 year curriculum, these concepts are developed and expanded into specific areas of expertise. For example, progressing core knowledge surrounding animal and plant cells into an understanding of complex specialised cells and their function within an organism. This is important as it enables students to see the similarities and differences between the multitude of organisms in nature and their purpose.
    - In chemistry students gain an understanding about the composition of the natural and synthetic world. Students study the fundamental principles of chemistry and develop these concepts through studying their applications as to how chemistry can be used to improve quality of living. This opens students' imaginations of the possibilities that new developments and infrastructure can bring to the developing world.
    - In physics students are taught about the forces and energies that govern nature and bring our world into existence. Students study in increasing depth the core principles of physics and refine their understanding of these concepts through using them as a lens to understand the world around them.
    - As a department we feel that it is highly important to investigate relevant and current concerns in science that are affecting the world such as genetic engineering crops, increase in radiations and climate change. For example, students study the causes of climate change and what society can do to help reduce the speed at which climate change is occurring. Students will also reflect on what they can do to help in their day to day lives in reducing the speed of climate change. The school has competed in local net zero challenges in order to bolster this understanding beyond the expectations of national curriculum.
    - In terms of PDS development we focus on reproduction and the changes that students go through during puberty, the physical and psychological effects that different drugs have on the human body. Looking at the causes and risk factors of diseases such as cancer and diabetes and what can we do to help limit the chance of getting these diseases. We are constantly looking at the debate between genetically modified crops compared to 'home grown' crops, identifying the advantages and disadvantages between both. Furthermore, with technology getting so much more prevalent in our students' lives, we highlight the risk of different radiating sources and the implications that this can cause.
    - Careers Spotlights are presented to students at key points within the SOW, to ensure that students are not only exposed to a variety of careers but can make explicit links between these careers and the content they are studying. We also have staff who have been involved in the scientific industry before teaching who can provide a more detailed overview of the career and be able to answer any direct questions that the students may have. This helps links into the student's sentences this could be directing them to go climb their mountain to university or a real alternative, which could be a science career that they have previously not known of, and have been introduced to by the science department. Those students who have not gone into a scientific career will encounter other scientific personnel in wider society, know the job role and be appreciative of the work that they do.
    - Science education has historically often overlooked figures who contributed to our modern scientific understanding of our world including women, ethnic minorities, and those with disabilities. A significant amount of time has been spent researching

both a more diverse range of scientists to spotlight in our lessons and integrating those scientists into our SOW, so they become a core part of the story of scientific development. We do this both through our science lectures and through specific lessons in the curriculum which is seen in the works of Henrietta Lacks whose stem cells were pivotal in developing modern medicine.

- We believe in a reading rich curriculum, and as a department we would like all of our students to be able to access scientific literature in the future so they can understand and grasp the key concepts that will changing the world. We like to introduce our students to subject specific language and break down the meaning of science concepts, ensuring that there is no barrier stopping our students' ability to grasp scientific concepts in the future.
- Science at Trinity provides the opportunity for our students to gain invaluable insight into the world and beyond. Ultimately, we believe that understanding the world, both natural and synthetic, allows students to connect with their surroundings on a cellular level and this connection will enable students to have the skills to pursue a top job in any scientific field and have a great life.

- **Beyond the National Curriculum**
  - We provide opportunity to explore the science curriculum even further by going beyond the national curriculum. Students in science will learn and understand how nuclear fission and fusion take place and how it can be beneficial for human life. In addition students look into the life cycle of stars, how a star was born to the day its cycle will end with a super nova.

Overview

All children are entitled to a curriculum and to the powerful knowledge which will open doors and maximise their life chances. Below is a high-level overview of the critical knowledge children will learn in this particular subject, at each key stage through to Year 11, in order to equip students with the cultural capital they need to succeed in life. The curriculum is planned vertically and horizontally giving thought to the optimum knowledge sequence for building secure schema.

		Knowledge, skills and understanding to be gained at each stage*		
		Cycle 1	**Cycle 2**	**Cycle 3**
Year 7	**Knowledge Introduced**	Science Skills. Chemistry - Particles and solutions	Chemistry - Atoms, elements & periodic table	Chemistry - Acid and Alkali
		Biology - cells and life processes	Biology - Ecology and reproduction	Physics - Waves
		Physics - Forces and space, Energy		
	Knowledge Revisited	Use of safety procedures Examples of animal and plants Different types of forces and energy. The names of different planets	Different states of matter Simple food chains Differences between male and females	Identify domestic acid and alkali products Identifying different waves such as water and sound waves
Year 8	**Knowledge Introduced**	Chemistry - chemical reactions and metals and reactivity	Chemistry-Environmental chemistry	Chemistry - Rocks and crude oil
		Physics - Forces and motions, electricity and magnetism	Physics - pressure, density and moments and nuclear physics and stars	Biology - Biology practical and projects
		Biology - The body and plants and photosynthesis	Biology- Health and disease, variation classification and inheritance, biology of exercise	
	Knowledge Revisited	Use periodic table to identify metal and non-metals Reactivity of Group 1 Alkali metals Forces and motion Building simple electrical circuits Different functions of the organs What's needed for photosynthesis	Different gases in the atmosphere Density of the different states Our solar systems star is the sun Different factors that affect out health Respiration equation	Different types of rocks What emissions are caused by fossil fuels burning Science skills Microscopes and photosynthesis

		Knowledge, skills and understanding to be gained at each stage*		
		Cycle 1	**Cycle 2**	**Cycle 3**
Year 9	**Knowledge Introduced**	Biology - Cell biology	Biology - Organisation Infection and response	Biology- Bioenergetics
		Chemistry - Atomic structure and PT	Chemistry - Structure and bonding, chemistry of the atmosphere	Physics- Energy
		Physics - Particles model of matter	Physics - Radioactivity	
	Knowledge Revisited	Animal and plant cells Atoms, elements and the periodic table States of matter (solid, liquid and gas)	Functions of organs and organ systems The four pathogens and diseases it causes Properties of elements and compounds Causes and implications of global warming Atoms and sub-atomic particles	Reactants and products of photosynthesis Uses of glucose in plants and animals Effect of exercise on the body Use of energy stores Transfer of energy stores Law of conservation of energy
Year 10	**Knowledge Introduced**	Biology - Bioenergetics Homeostasis	Biology - Inheritance	Biology - Ecology
		Chemistry- Quantitative chemistry Chemical changes	Chemistry - Energy changes Rate and extent of change	Chemistry - Organic chemistry Chemical analysis
		Physics - Forces	Physics - Waves	Physics - Electromagnetism
	Knowledge Revisited	Specialised cells and differences between males and females Atomic structure and Periodic table Acid and Alkali / metal reactivity Different forces and uses Speed = Distance / Time	Genetics, variations and sexual reproduction Reactions and energy in reactions Different waves and uses of waves	Food webs and chains Human impact on the environment Crude oil / elements and compound / chromatography Magnetism and uses of how to make an electromagnet
Year 11	**Knowledge Introduced**	Biology - Ecology		
		Chemistry - Chemical analysis Using resources / chemistry of the atmosphere		
		Physics - Waves / Electromagnetism		
	Knowledge Revisited	Food webs and chains Human impact on the environment Elements and compounds / chromatography / Causes and		

		Knowledge, skills and understanding to be gained at each stage*		
		Cycle 1	**Cycle 2**	**Cycle 3**
		implications of global warming / Uses of different materials Define and uses of waves / magnetism and how to make an electro magnet		

A powerful, knowledge-rich curriculum teaches both substantive knowledge (facts; knowing that something is the case; what we think about) and non-declarative or procedural knowledge (skills and processes; knowing how to do something; what we think with). There are no skills without bodies of knowledge to underpin them. In some subjects, a further distinction can be made between substantive knowledge (the domain specific knowledge accrued e.g. knowledge of the past) and disciplinary knowledge (how the knowledge is accrued e.g. historical reasoning). Please refer to the DAT Curriculum Principles, published on the Trust website, for further information about how we have designed our curriculum around these concepts .

Homework

From Y7 onwards, our belief is that homework should be interleaved revision of powerful knowledge that has been modelled and taught in lessons. This knowledge is recalled and applied through a range of low-stakes quizzing and practice for every year group and is tied to Morning Meeting.

In addition, to support depth of learning and retrieval of powerful knowledge specifically in our subject domain we also:

- Powerful knowledge which is taught in science lessons at the academy is further supported at home through Seneca learning. Seneca learning is an online platform that our students are signed upon which provides different scientific tasks set by science teachers on previous knowledge that the students have learned. It follows a consistent lay out of providing knowledge and then answering questions upon that knowledge, the results of how the students did is automated and can be viewed by their teachers. Furthermore, for students in Y11 and Y10 we have created homework that consists of scientific knowledge, retrieval questions and then an application question. This is specifically used to help students close certain gaps in knowledge and used as a resource to help students apply their learning to different scenarios.